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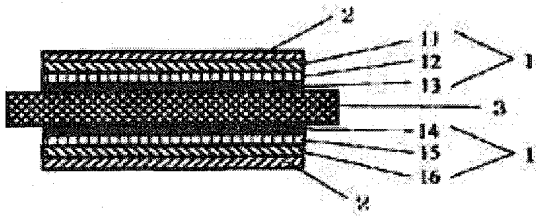
(54) COMPOSITE OPTICAL RETARDATION PLATE, OPTICAL COMPENSATION POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To develop an optical retardation plate capable of forming a liquid crystal display device excellent in a viewing angle with nice visibility by highly compensating optical retardation due to birefringence of a TN(twisted nematic) liquid crystal even when a large sized screen is used.
SOLUTION: The composite optical retardation plate (1) consists of a laminated body having one layer or two or more layers of respective optical retardation layers (A) comprising birefringent films (11, 16) composed of an oriented polymer exhibiting positive intrinsic birefringence and satisfying optical retardation characteristics of Δnxy.d≤100 nm, Δnxz.d≤100 nm and Δnyz.d≤100 nm where refractive indexes in plane, refractive index in thickness direction and layer thickness are expressed as nx, ny, nz and d respectively and equations |nx−ny|=Δnxy, |nx−nz|=Δnxz and |ny−nz|=Δnyz hold, optical retardation layers (B) comprising birefringent films (13, 14) composed of an oriented polymer exhibiting negative intrinsic birefringence and satisfying the optical retardation characteristics and optical retardation layers (C: 12, 15) comprising a liquid crystal compound exhibiting positive or negative intrinsic birefringence with an obliquely oriented optic axis.



CLAIMS

[Claim(s)]
[Claim 1]When a refractive index of nx, ny, and a thickness direction is set to nz and thickness is set to d, |nx-ny|=**nxy, |nx-nz|=**nxz, and |ny-nz|=**nyz for a refractive index within a field, . Satisfy the phase contrast characteristic (**nxy-d<=100nm, **nxz-d<=100nm, and **nyz-d<=100nm). A phase difference layer (A) which consists of a refractive-index-anisotropy film in which Polymer Division in which positive peculiar birefringence is shown carries out orientation, A phase difference layer (B) which consists of a refractive-index-anisotropy film in which Polymer Division in which negative peculiar birefringence is shown carries out orientation, and satisfies the aforementioned phase contrast characteristic, And a compound presentation phase reference board consisting of a layered product which has a phase difference layer (C) in which an optic axis of a liquid crystal compound in which positive or negative peculiar birefringence is shown carries out inclined orientation one layer or more than two-layer, respectively.
[Claim 2]An optical compensation polarizing plate consisting of a layered product of a compound presentation phase reference board according to claim 1 and a polarizing plate.
[Claim 3]A liquid crystal display having the compound presentation phase reference board according to claim 1 between a polarizing plate and a liquid crystal cell.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the compound presentation phase reference board and optical compensation polarizing plate which can form the liquid crystal display which compensates the double reflex by a TN liquid crystal highly, and is excellent in the angle of visibility of high contrast.
[0002]
[Description of the Prior Art]The inside where its attention is paid by high speed response nature and the high contrast nature in a front direction, and TFT-LCD (liquid crystal display) using a TN

liquid crystal spreads through various displays, such as television and a personal computer monitor, widely, The improvement of the straitness of the right visual recognition angle of visibility by the remarkable fall of the contrast in the direction of strabism, reversal (tone reversal) of a gradation display, etc. is called for, and control of high-contrast-izing, or wide-field-of-view cornification and the foreground-color change by an angle of visibility and equalization of a screen display have been important SUBJECT especially with enlargement of a screen.

[0003]The proposal which is compensated with a phase difference plate for the phase contrast by the double reflex of a TN liquid crystal as the aforementioned remedy and to which the angle of visibility of right visual recognition is expanded conventionally is made, the wide view film (a trade name.) in which the optic axis of the nematic liquid crystal in which the discotheque liquid crystal or the positive peculiar birefringence which shows negative peculiar birefringence as a compensating plate for the angle-of-visibility expansion is shown carries out inclined orientation The Fuji Photo Film Co., Ltd. make and NH film (a trade name, the Nippon Oil chemicals company make), the superimposed type compensating plate (JP,H7-35924,A.) which laminated the phase difference plate which consists of an uniaxial stretched film by Polymer Division in which positive peculiar birefringence is shown so that those directions of the principal indices of refraction might intersect perpendicularly in the combination of what has the optical axis in a field, and the thing inclined to the field JP,H7-306406,A and JP,H10-123506,A were known.

[0004]However, with the aforementioned wide view film, contrast fell remarkably with the angle of visibility inclined 60 degrees or more from the front direction, and there was a problem which a coloring phenomenon generates in the white displaying condition which does not impress voltage. With NH film, when the angle of visibility was changed by the black display state which impressed voltage, it discolored and there was a problem which becomes less black. In the further aforementioned superimposed type compensating plate, there was a problem which a remarkable coloring phenomenon generates in change of an angle of visibility. Therefore, in the conventional compensating plate, the phase contrast characteristic of the TN liquid crystal could not fully be coped with, but there was a problem cannot be satisfied with an improvement of the visual recognition characteristic of a problem.

[0005]

[Technical problem of an invention] This invention aims at development of the phase difference plate which can form the liquid crystal display which is excellent in the angle of visibility and contrast which can compensate highly the phase contrast also by the double reflex of a TN liquid crystal or case of a large-sized screen, and do not carry out tone reversal, and is excellent in the control of foreground-color change and the homogeneity of a screen display by an angle of visibility.

[0006]

[Means for Solving the Problem]When this invention sets a refractive index of nx, ny, and a thickness direction to nz and sets thickness to d, |nx-ny|=**nxy, |nx-nz|=**nxz, and |ny-nz|=**nyz for a refractive index within a field, . Satisfy the phase contrast characteristic (**nxy-d<=100nm, **nxz-d<=100nm, and **nyz-d<=100nm). A phase difference layer (A) which consists of a refractive-index-anisotropy film in which Polymer Division in which positive peculiar birefringence is shown carries out orientation, A phase difference layer (B) which consists of a

refractive-index-anisotropy film in which Polymer Division in which negative peculiar birefringence is shown carries out orientation, and satisfies the aforementioned phase contrast characteristic, And a compound presentation phase reference board consisting of a layered product which has a phase difference layer (C) in which an optic axis of a liquid crystal compound in which positive or negative peculiar birefringence is shown carries out inclined orientation one layer or more than two-layer, respectively is provided.

[0007]A liquid crystal display having an optical compensation polarizing plate, wherein this invention consists of a layered product of the aforementioned compound presentation phase reference board and a polarizing plate, and the aforementioned compound presentation phase reference board between a polarizing plate and a liquid crystal cell is provided.

[0008]

[Effect of the Invention]According to this invention, by composite-ization of the phase contrast which combined (A) of the above-mentioned phase difference layer, (B), and (C). The phase difference plate with which the phase contrast by the double reflex of a TN liquid crystal can be highly compensated in an omnidirection angle can be obtained, also when it is a large-sized screen, the angle of visibility which does not carry out tone reversal is large, a foreground color cannot change easily due to an angle of visibility, and the liquid crystal display which is excellent in the homogeneity of contrast or a screen display can be formed.

[0009]

[Embodiment of the Invention]When the compound presentation phase reference board by this invention sets the refractive index of nx, ny, and a thickness direction to nz and sets thickness to d, |nx-ny|=**nxy, |nx-nz|=**nxz, and |ny-nz|=**nyz for the refractive index within a field, . Satisfy the phase contrast characteristic (**nxy-d<=100nm, **nxz-d<=100nm, and **nyz-d<=100nm). The phase difference layer (A) which consists of a refractive-index-anisotropy film in which Polymer Division in which positive peculiar birefringence is shown carries out orientation, It consists of a layered product which has a phase difference layer (B) which consists of a refractive-index-anisotropy film in which Polymer Division in which negative peculiar birefringence is shown carries out orientation, and satisfies the aforementioned phase contrast characteristic, and a phase difference layer (C) in which the optic axis of the liquid crystal compound in which positive or negative peculiar birefringence is shown carries out inclined orientation one layer or more than two-layer, respectively.

[0010]The example of said compound presentation phase reference board was shown in drawing 1. 1 is a compound presentation phase reference board which consists of a layered product of a phase difference layer (A), (B), and (C), and, in 11 and 16, a phase difference layer (B), and 12 and 15 are [a phase difference layer (A), and 13 and 14] phase difference layers (C). The figure shows what was used as the liquid crystal display.

2 is a polarizing plate and 3 is a liquid crystal cell.

in addition -- in the above -- the positive/negative of peculiar birefringence -- polarization of Polymer Division thru/or a liquid crystal compound -- the direction of a molecular axis -- it is (right) -- it depends for being in the direction right-angled to a molecular axis (negative).

[0011]A phase difference layer (A) is formed with the refractive-index-anisotropy film in which Polymer Division in which positive peculiar birefringence is shown carries out orientation, and a

phase difference layer (B) is formed with the refractive-index-anisotropy film in which Polymer Division in which negative peculiar birefringence is shown carries out orientation, and. Both a phase difference layer (A) and (B) the refractive index of nx, ny, and a thickness direction for the refractive index within a field nz, When thickness is set to d, |nx-ny|=**nxy, |nx-nz|=**nxz, and |ny-nz|=**nyz (it is below the same), the phase contrast characteristic (**nxy-d<=100nm, **nxz-d<=100nm, and **nyz-d<=100nm) shall be satisfied. As for this phase contrast, it is more preferred than the point of a compensation effect to be based on monochromatic light with a wavelength of 590 nm.

[0012]There is no limitation in particular about Polymer Division which forms the refractive-index-anisotropy film which makes (A) of a phase difference layer, or (B), and the proper transparent polymers in which the aforementioned peculiar birefringence is shown can be used. As an example of Polymer Division in which positive peculiar birefringence is incidentally shown, Polycarbonate, polyarylate and polysulfone, polyolefine and polyethylene terephthalate, polyethylenenaphthalate, norbornene system polymer, the polymer that mixed two sorts, cellulose type polymer and these polymer, or three sorts or more, etc. are raised. The polymer etc. which mixed two sorts of styrene system polymer, acrylic polymer, the styrene system copolymer which improved those brittleness and an acrylic copolymer, and these polymer, or three sorts or more as an example of Polymer Division in which negative positive peculiar birefringence is shown are raised.

[0013]A refractive-index-anisotropy film can be formed by carrying out orientation of Polymer Division which processes a film by proper methods, such as uniaxial stretching and biaxial stretching, for example, and forms a film, it is excellent in light transmittance and what has few orientation nonuniformity and phase contrast nonuniformity can use it preferably. Incidentally the extension direction is made into the nx direction by the orientation treatment by uniaxial stretching, With Polymer Division in which positive peculiar birefringence is shown, the film which has the refractive index anisotropy of nx<ny (perfect uniaxial stretching nx<ny=nz) is obtained with nx>ny (perfect uniaxial stretching nx>ny=nz) and Polymer Division in which negative peculiar birefringence is shown.

[0014]As for the refractive-index-anisotropy film which forms the phase difference layer (A) and (B), nx and ny of the refractive index within a field are different, and arbitrary values can be taken in the range with which it is satisfied of the phase contrast characteristic which should just have described above the refractive index nz of the thickness direction. therefore, nz -- nx and ny -- on the other hand -- or it may be larger than both -- it may carry out, and may be small and may be the same as the middle of nx and ny, or one side of nx and ny. The method which controls nx, ny, and nz, the method which controls film thickness d, etc. can attain the above-mentioned phase contrast characteristic. In that case, especially film thickness d has 1-500 micrometers of common things which 10-350 micrometers shall be 20-200 micrometers above all.

[0015]A phase difference layer (C) is formed in that to which orientation of the liquid crystal compound in which positive or negative peculiar birefringence is shown was carried out so that the optic axis might incline to the normal line direction of a layer flat surface. The formation the liquid crystal and liquid crystal polymer of polymerization nature, for example under impression of an electric field, a magnetic field, etc., Or after carrying out orientation so that a molecular axis

may incline to a stratification plane via a rubbing film, the orienting film for Mitsutoshi, etc., a method with proper method which carries out polymerization of the polymerization nature liquid crystal via light, heat, etc., method which carries out quenching immobilization of the liquid crystal polymer of thermal orientation, etc. can perform. The optical property based on the inclined orientation of a phase difference layer (C), etc. can be suitably determined according to the optical property of the TN liquid crystal for compensation, etc. Although the thickness of a phase difference layer (C) shall be suitably determined according to the phase contrast characteristic etc. which are made into the purpose and shall generally be 0.1-10 micrometers especially 20 micrometers or less above all 100 micrometers or less based on liquid crystal layer thickness, it is not limited to this.

[0016]As a liquid crystal compound in which the positive or negative peculiar birefringence which forms a phase difference layer (C) is shown, one sort or two sorts or more can be used for what has a proper thing of a disco CHIIKU system, a nematic system, a cholesteric system, or a smectic system, etc. The thing of a **** disco CHIIKU system in the wide view film above-mentioned as a liquid crystal compound in which negative peculiar birefringence (**n<0) is shown from points, such as the processability of inclined orientation, above all is used preferably, The thing of a **** nematic system in the NH film above-mentioned as a liquid crystal compound in which positive peculiar birefringence (**n>0) is shown can use preferably. The aforementioned **n means (ne-no).

[0017]When it is leaned to the slope direction (the direction of +) of an optic axis, or its counter direction (the direction of -) from the normal line direction of a layer based on the inclined orientation characteristic by the aforementioned phase difference layer (C), It can avoid that phase contrast serves as a symmetric figure in the aforementioned plus and the direction of minus by making a normal line direction into a standard (zero incidence angle), and improvement in a compensation effect can be aimed at.

[0018]Namely, the TN liquid crystal in which positive peculiar birefringence is shown, From it being in the state where the optic axis inclined to the cell substrate at the time of the black display by voltage impressing in the liquid crystal cell, compensation at the time of the black display of voltage impressing can be advantageously performed by the phase difference layer (C) in which the liquid crystal compound in which negative peculiar birefringence is shown carried out inclined orientation, and an angle of visibility can be improved. A halftone display state can be advantageously compensated with the phase difference layer (C) in which the liquid crystal compound in which positive peculiar birefringence is shown carried out inclined orientation.

[0019]A compound presentation phase reference board can be formed like the example of drawing 1 as a layered product which used (A) of a phase difference layer, and each of (B) and (C). One layer or more than two-layer can be used for the Gentlemen phase reference layer of said A, B, and C when forming a layered product, respectively, and there is no limitation in particular about those arrangement order. Although the phase difference layer (A), (B), and (C) can consider it as proper arrangement relationship when forming a layered product, it is more preferred than points, such as a compensation effect, to arrange so that each lagging axis is parallel or may generally intersect perpendicularly as much as possible. Control of the phase contrast in a compound presentation phase reference board, etc. can be performed by regulation

of arrangement angles, such as combination of a phase difference layer (A), (B), and (C), a usage number, a lagging axis, etc.

[0020]The phase difference layer (A) and (B) can also be made into the gestalt which made it serve as the supporting substrate of a phase difference layer (C), or the transparent protection layer of a polarization film if needed, and attained slimming down etc. by consisting of films when forming said layered product. especially -- drawing 1 -- an example -- like -- a compound presentation -- phase reference -- a board -- one -- forming -- a phase difference layer -- (-- A --) -- (-- B --) -- 11 -- 13 -- 14 -- 16 -- one side -- a phase difference layer (C) -- it being made to serve as the supporting substrate of 12 and 15, and. By considering it as the compound presentation phase reference board 1 and the optical compensation polarizing plate which laminated the polarizing plate 2, where another side of a phase difference layer (A) and (B) is made to serve as the transparent protection layer of a polarization film, the slimming down and shortening of a manufacturing process can be attained, and it is desirable. The gestalt which located the phase difference layer (C) which consists of liquid crystal layers between (A) of a phase difference layer and (B) is more preferred than points, such as protection of the phase difference layer (C) in the time of handling, etc., like the example of a figure. Proper adhesives, such as a binder, can be used when laminating a phase difference layer.

[0021]The new phase contrast characteristic can be given like the above by composite-ization by the combination of (A) of a phase difference layer, (B), and (C), The abundant phase difference plates in which various kinds of phase contrast characteristics that the phase contrast by the double reflex of a TN liquid crystal, change by the viewing angle, etc. can be compensated are shown can be obtained, and it can compensate with high precision also to a difference of the double refraction property by the difference in the oriented state of a TN liquid crystal, etc.

[0022]Namely, like the conventional above-mentioned wide view film and NH film by (A) of a phase difference layer, and (C). For example, the point that the contrast in the angle of visibility of 60 degrees or more falls greatly and the point which coloring generates in a white display, Or by compensating with a phase difference layer (B) the point which discolors by black display and compensation effects, such as a point which becomes less black, run short of, and compensating it with the phase difference layer concerned of three layers at least, It is also possible to form the TN liquid crystal display in which contrast good without change of a foreground color is shown to a normal (front direction) with the large angle of visibility by an abbreviated 80 degree omnidirection angle.

[0023]Practical use can also be presented with the compound presentation phase reference board by this invention as it is, like the example of drawing 1, it can be laminated with the polarizing plate 2 and practical use can also be presented with it as an optical compensation polarizing plate. A proper polarizing plate can be used for formation of the optical compensation polarizing plate, and there is no limitation in particular in it about the kind. Above all, the linear polarization of a predetermined plane of vibration is penetrated, and the absorbed type polarizing plate in which the characteristic to absorb is shown can use other lights more preferably than the point of a high polarization degree, etc.

[0024]Incidentally as an example of said polarizing plate, a polyvinyl alcohol system and a partial formal-ized polyvinyl alcohol system, The polarization film which made dichroism substances,

such as iodine and/or dichromatic dye, adsorb, and carried out stretch orientation processing, the polarization film of polyene orientation, etc. are used for the film of the hydrophilic giant molecules like an ethylene-vinyl acetate copolymer system partial saponification thing.

[0025]A polarizing plate may be what provided transparent protection layer in one side or both sides of the polarization film. Transparent protection layer is provided for the various purpose, such as reinforcement of a polarization film, heat resistance, damp-proof improvement. Transparent protection layer can be formed as the coating layer of resin, a laminate layer of a resin film, etc., and may contain the particles diffusion-izing, for surface roughening, etc. Transparent protection layer may be provided as a phase difference layer (A) and (B), as described above. In that case, like the example of a figure, the phase difference layer (A) or (B) which forms the compound presentation phase reference board by this invention will serve as the transparent protection layer of one side of the polarization film in the polarizing plate 2, and is advantageous to slimming down of an optical compensation polarizing plate, or improvement in the assembly efficiency of a liquid crystal display.

[0026]An antireflection layer and an anti-glare treatment layer may be provided for the purpose of prevention etc. of the surface reflection to the side in which the polarizing plate further in particular to be used does not form a compound presentation phase reference board. An antireflection layer can be suitably formed, for example as a film of light interference nature, such as a coated layer of fluorine system polymer, and a multilevel-metal vacuum evaporation film, etc. On the other hand, an anti-glare treatment layer may also be formed by the proper method which surface reflected light diffuses by proper methods, such as a resin coating layer of particle content, embossing and sand blast processing, and etching processing, giving fine rugged structure to the surface, for example etc.

[0027]The silica and the calcium oxide whose mean particle diameter is 0.5-20 micrometers at the aforementioned particles, for example, Alumina, a titania, zirconia and tin oxide, indium oxide and cadmium oxide, proper things, such as organic system particles which the conductive thing of antimony oxide etc. also becomes from a certain inorganic system particle, polymethylmethacrylate, or proper polymer like Pori Urreta and for which a bridge is not constructed [bridge construction or], -- one sort -- or two or more sorts can be used.

[0028]About the arrangement relationship of a phase leading axis of a compound presentation phase reference board, etc. a transmission axis of a polarizing plate, etc. in an optical compensation polarizing plate, there is no limitation in particular and it can determine suitably. It is more desirable than the point of arranging the maximum-refractive-index direction within a field of the transmission axis of a polarizing plate and a compound presentation phase reference board to parallel relationship or orthogonality relation generally controlling the characteristic of an oblique direction that a viewing angle changes without affecting the characteristic of the direction of a transverse plane (vertical), and aiming at expansion of an angle of visibility, etc.

[0029]Although each class which forms the compound presentation phase reference board and optical compensation polarizing plate by this invention, such as a phase difference layer and a polarizing plate, may be in a separation state, the thing [that adherence processing of all is carried out above all in part] is more preferred than points, such as prevention from invasion of foreign matters, such as control of reflection by the refractive index difference regulation

between layers, gap prevention of an optical system, and garbage. Proper things, such as transparent adhesives, can be used for the adherence processing, for example, and there is no limitation in particular about the kind of adhesives etc. What does not require a hot process in the case of hardening at the time of adhesion treatment or desiccation is preferred, and what does not require prolonged curing treatment or drying time is more desirable than points, such as prevention from change of the optical property of members forming. Rather than this point, an adhesive layer can use preferably.

[0030]The transparent binder which uses proper polymer, such as an acrylic polymer, silicone series polymer and polyester, polyurethane and polyether, and a synthetic rubber, for example can be used for formation of an adhesive layer. Above all, acrylic pressure sensitive adhesive is more preferred than points, such as optical transparency, adhesion characteristics, weatherability. An adhesive layer can also be provided in one side or both sides, such as a compound presentation phase reference board and an optical compensation polarizing plate, if needed for the purpose of adhesion to adherends, such as a liquid crystal cell. It is preferred to install a separator etc. tentatively and to prevent contamination on the surface of an adhesive layer, etc. until it presents practical use with it, when an adhesive layer is exposed to the surface.

[0031]The compound presentation phase reference board and optical compensation polarizing plate by this invention can be preferably used for formation of a liquid crystal display as a compensating plate to the double reflex by the liquid crystal, especially a TN liquid crystal, etc. Although a liquid crystal display is formed by assembling suitably component parts, such as a polarizing plate, a liquid crystal cell, a back light a compensating plate and as occasion demands thru/or front light, and a light reflector, and generally incorporating a drive circuit etc., There is no limitation in particular except for the point using a compound presentation phase reference board and an optical compensation polarizing plate above-mentioned in this invention, and a liquid crystal display can be formed according to the former.

[0032]Therefore, when forming a liquid crystal display, proper optical elements, such as optical-path control strips, such as a prism sheet provided in an optical diffusion board, an anti glare layer, the prism sheet and antireflection film that are provided, for example on the polarizing plate by the side of visual recognition, a protective layer, a guard plate, and a back light, can be arranged suitably. A compensating plate is usually arranged like the example of a figure between the polarizing plates 2 by the side of the liquid crystal cell 3, visual recognition, or/and a back light. Therefore, even if the compound presentation phase reference board or optical compensation polarizing plate by this invention has few liquid crystal cells, it should just be arranged at one side.

[0033]

[Example]Stretching treatment of the norbornene system polymer film (the product made by JSR, ARTON) with a working example 1 thickness of 100 micrometers is carried out at 175 ** with a tenter drawing machine, It has the refractive index characteristic of nx>ny>nz and **nxy-d by monochromatic light with a wavelength of 590 nm (it is below the same) obtained the phase difference layer (**nxz-d=80nm and **nyz-d=70nm) A1 at 10 nm. The refractive index was measured with the automatic double reflex plan (it is [prince measuring machine machine company make, KOBRA-21ADH, and the following] the same).

[0034]Next, on the aforementioned phase difference layer A1, By the method which carries out transfer via adhesives under heating humidifying treatment, only the inclined orientation layer of the disco tic liquid crystal polymer of a wide view film (WV02A) is transferred so that the slope direction may become parallel to the direction (the extension direction) of the maximum refractive index (nx) of the phase difference layer A1 of the inside of a field. The phase difference layer C1 was laminated and the layered product was obtained. When Ny and Nx-Ny were set to **Nxy and thickness was set to D for the refractive index of the direction which intersects perpendicularly the maximum refractive index within a field of this layered product in Nx and its direction, **Nxy-D of the layered product was 130 nm. Nx aimed to have intersected perpendicularly to said nx.

[0035]subsequently, the aforementioned phase difference layer C1 top -- a 125-micrometer-thick acrylic system polymer film (the Mitsubishi Rayon Co., Ltd. make.) It has the refractive index characteristic of ny=nz>nx which obtained AKURIPUREN by carrying out uniaxial-stretching processing (the nx direction) at 110 ** by the tenter, the phase difference layer (**nxy-d=**nxz-d=30nm and **nyz-d=0nm) B1 was laminated via the acrylic adhesive layer, and the compound presentation phase reference board was obtained.

[0036]Next, after dyeing a 75-micrometer-thick polyvinyl alcohol film in the solution containing iodine, An 80-micrometer-thick triacetyl cellulose film is pasted up on one side of the polarization film obtained by increasing uniaxial stretching 6 times between the rolls with which peripheral speed differs via polyvinyl alcohol system adhesives in the solution containing boric acid, on the other hand, the polarization film was alike, adhesion lamination of the aforementioned compound presentation phase reference board was carried out via the phase difference layer A1 via polyvinyl alcohol system adhesives, and the optical compensation polarizing plate was obtained.

[0037]Replaced with the comparative example compound presentation phase reference board, and adhesion lamination was carried out via the phase difference layer A1 using the layered product of the above-mentioned phase difference layer A1 and the phase difference layer C1, and also the optical compensation polarizing plate was obtained according to working example 1.

[0038]The optical compensation polarizing plate obtained by evaluation test working example 1 and a comparative example was pasted up so that a polarizing plate might serve as the outside to both sides of a TN liquid crystal cell, the liquid crystal display was obtained, and the view angle characteristic of the display contrast was investigated with the contrast measuring instrument (the product made by ELDIM, EZContrast). The contrast [result / the] curve showed to drawing 2. The view angle characteristic of contrast 10 standard of the direction of four directions was shown in the following table.

Above Down Left Rightward working example 1 60 80 or more 80 or more 80 degrees or more Ratio ** Example 52 52 60 63 degrees[0039]It turns out that the angle of visibility of right visual recognition is mostly expanded greatly in an omnidirection from the above result in working example.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The sectional view of the example of a liquid crystal display

[Drawing 2]Contrast curves, such as working example 1 and a comparative example

[Description of Notations]

1: Compound presentation phase reference board

11, 16: Phase difference layer (A)

13, 14: Phase difference layer (B)

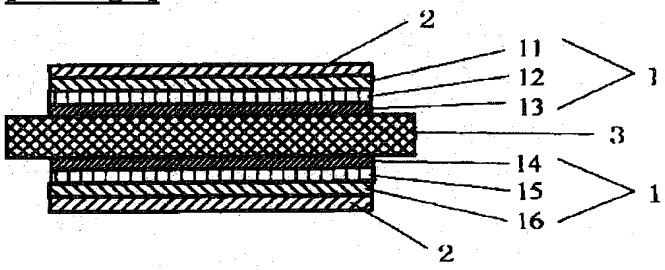
12, 15: Phase difference layer (C)

2: Polarizing plate

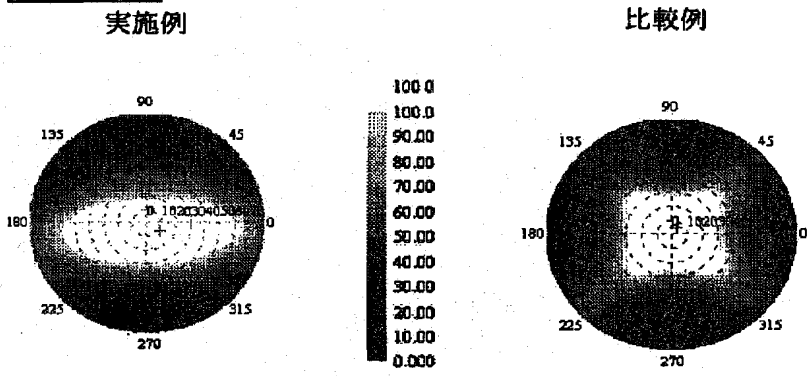
3: Liquid crystal cell

DRAWINGS

[Drawing 1]



[Drawing 2]



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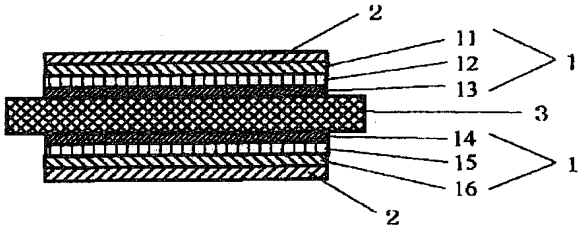
(54)【発明の名称】　複合位相差板、光学補償偏光板及び液晶表示装置

(57)【要約】
【課題】　大型画面の場合にもＴＮ液晶の複屈折による位相差を高度に補償できて良視認の視野角に優れる液晶表示装置を形成できる位相差板の開発。
【解決手段】　面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、｜ｎｘ－ｎｙ｜＝△ｎｘｙ、｜ｎｘ－ｎｚ｜＝△ｎｘｚ及び｜ｎｙ－ｎｚ｜＝△ｎｙｚとしたとき、△ｎｘｙ・ｄ≦１００ｎｍ、△ｎｘｚ・ｄ≦１００ｎｍかつ△ｎｙｚ・ｄ≦１００ｎｍの位相差特性を満足する、正の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルム（１１、１６）よりなる位相差層（Ａ）、負の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルム（１３、１４）よりなり前記の位相差特性を満足する位相差層（Ｂ）、及び正又は負の固有複屈折性を示す液晶化合物の光軸が傾斜配向してなる位相差層（Ｃ：１２、１５）をそれぞれ１層又は２層以上有する積層体からなる複合位相差板（１）。



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【特許請求の範囲】

【請求項１】　面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、｜ｎｘ－ｎｙ｜＝△ｎｘｙ、｜ｎｘ－ｎｚ｜＝△ｎｘｚ及び｜ｎｙ－ｎｚ｜＝△ｎｙｚとしたとき、△ｎｘｙ・ｄ≦１００ｎｍ、△ｎｘｚ・ｄ≦１００ｎｍかつ△ｎｙｚ・ｄ≦１００ｎｍの位相差特性を満足する、正の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムよりなる位相差層（Ａ）、負の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムよりなり前記の位相差特性を満足する位相差層（Ｂ）、及び正又は負の固有複屈折性を示す液晶化合物の光軸が傾斜配向してなる位相差層（Ｃ）をそれぞれ１層又は２層以上有する積層体からなることを特徴とする複合位相差板。

【請求項２】　請求項１に記載の複合位相差板と偏光板の積層体からなることを特徴とする光学補償偏光板。

【請求項３】　請求項１に記載の複合位相差板を偏光板と液晶セルの間に有することを特徴とする液晶表示装置。

【発明の詳細な説明】

【０００１】

【発明の技術分野】本発明は、ＴＮ液晶による複屈折を高度に補償して高コントラストの視野角に優れる液晶表示装置を形成しうる複合位相差板及び光学補償偏光板に関する。

【０００２】

【従来の技術】高速応答性や正面方向での高コントラスト性に着目されてＴＮ液晶を用いたＴＦＴ－ＬＣＤ（液晶表示装置）がテレビやパソコンモニタ等の各種表示装置に広く普及する中、斜視方向でのコントラストの著しい低下や階調表示の反転（階調反転）等による良視認視野角の狭さの改善が求められており、高コントラスト化や広視野角化、視野角による表示色変化の抑制や画面表示の均一化が画面の大型化に伴い特に重要な課題となっている。

【０００３】従来、前記の改善策としては位相差板にてＴＮ液晶の複屈折による位相差を補償して良視認の視野角を拡大する提案がなされており、その視野角拡大用の補償板として負の固有複屈折性を示すディスコティク液晶又は正の固有複屈折性を示すネマチック液晶の光軸が傾斜配向してなるワイドビューフィルム（商品名、富士写真フイルム社製）やＮＨフィルム（商品名、日本石油化学社製）、正の固有複屈折性を示す高分子による一軸延伸フィルムからなる位相差板をその光学軸が面内にあるものと面に対して傾斜したものとの組合せでそれらの主屈折率方向が直交するように積層した重畳型の補償板（特開平７－３５９２４号公報、特開平７－３０６４０６号公報、特開平１０－１２３５０６号公報、）が知られていた。

【０００４】しかしながら、前記のワイドビューフィルムでは正面方向から６０度以上傾斜した視野角でコントラストが著しく低下し、電圧を印加しない白表示状態で着色現象が発生する問題点があった。またＮＨフィルムでは電圧を印加した黒表示状態で視野角を変えると変色して黒色でなくなる問題点があった。さらに前記の重畳型補償板では視野角の変化で著しい着色現象が発生する問題点があった。従って従来の補償板ではＴＮ液晶の位相差特性に充分に対処できず、その視認特性の改善に満足できない問題点があった。

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【０００５】

【発明の技術的課題】本発明は、大型画面の場合にもＴＮ液晶の複屈折による位相差を高度に補償できて階調反転しない視野角やコントラストに優れ、視野角による表示色変化の抑制や画面表示の均一性に優れる液晶表示装置を形成できる位相差板の開発を目的とする。

【０００６】

【課題の解決手段】本発明は、面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、｜ｎｘ－ｎｙ｜＝△ｎｘｙ、｜ｎｘ－ｎｚ｜＝△ｎｘｚ及び｜ｎｙ－ｎｚ｜＝△ｎｙｚとしたとき、△ｎｘｙ・ｄ≦１００ｎｍ、△ｎｘｚ・ｄ≦１００ｎｍかつ△ｎｙｚ・ｄ≦１００ｎｍの位相差特性を満足する、正の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムよりなる位相差層（Ａ）、負の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムよりなり前記の位相差特性を満足する位相差層（Ｂ）、及び正又は負の固有複屈折性を示す液晶化合物の光軸が傾斜配向してなる位相差層（Ｃ）をそれぞれ１層又は２層以上有する積層体からなることを特徴とする複合位相差板を提供するものである。

【０００７】また本発明は、前記の複合位相差板と偏光板の積層体からなることを特徴とする光学補償偏光板、及び前記の複合位相差板を偏光板と液晶セルの間に有することを特徴とする液晶表示装置を提供するものである。

【０００８】

【発明の効果】本発明によれば、上記した位相差層の（Ａ）、（Ｂ）、（Ｃ）を組合せた位相差の複合化により、ＴＮ液晶の複屈折による位相差を全方位角において高度に補償できる位相差板を得ることができ、大型画面の場合にも階調反転しない視野角が広くて視野角により表示色が変化しにくく、コントラストや画面表示の均一性に優れる液晶表示装置を形成することができる。

【０００９】

【発明の実施形態】本発明による複合位相差板は、面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、｜ｎｘ－ｎｙ｜＝△ｎｘｙ、｜ｎｘ－ｎｚ｜＝△ｎｘｚ及び｜ｎｙ－ｎｚ｜＝△ｎｙｚとしたとき、△ｎｘｙ・ｄ≦１００ｎｍ、△ｎｘｚ・ｄ≦１００ｎｍかつ△ｎｙｚ・ｄ≦１００ｎｍの位相差特性を満足する、正の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムよりなる位相差層（Ａ）、負の固有複屈折性を示す高分子が配向してなる

屈折率異方性フィルムよりなり前記の位相差特性を満足する位相差層（Ｂ）、及び正又は負の固有複屈折性を示す液晶化合物の光軸が傾斜配向してなる位相差層（Ｃ）をそれぞれ１層又は２層以上有する積層体からなる。

【００１０】前記複合位相差板の例を図１に示した。１が位相差層（Ａ）、（Ｂ）、（Ｃ）の積層体からなる複合位相差板であり、１１，１６が位相差層（Ａ）、１３，１４が位相差層（Ｂ）、１２，１５が位相差層（Ｃ）である。図は、液晶表示装置としたものを示しており、２が偏光板、３が液晶セルである。なお前記において固有複屈折性の正負は、高分子ないし液晶化合物の分極が分子軸の方向にある（正）か、分子軸に直角な方向にある（負）かによる。

【００１１】位相差層（Ａ）は正の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムにて形成され、位相差層（Ｂ）は負の固有複屈折性を示す高分子が配向してなる屈折率異方性フィルムにて形成されると共に、位相差層（Ａ）、（Ｂ）のいずれも面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、｜ｎｘ－ｎｙ｜＝△ｎｘｙ、｜ｎｘ－ｎｚ｜＝△ｎｘｚ及び｜ｎｙ－ｎｚ｜＝△ｎｙｚとしたとき（以下同じ）、△ｎｘｙ・ｄ≦１００nm、△ｎｘｚ・ｄ≦１００nmかつ△ｎｙｚ・ｄ≦１００nmの位相差特性を満足するものとされる。斯かる位相差は、補償効果の点より波長５９０nmの単色光に基づくことが好ましい。

【００１２】位相差層の（Ａ）又は（Ｂ）をなす屈折率異方性フィルムを形成する高分子については特に限定はなく、前記の固有複屈折性を示す適宜な透明高分子を用いることができる。ちなみに正の固有複屈折性を示す高分子の例としては、ポリカーボネートやポリアリレート、ポリスルホンやポリオレフィン、ポリエチレンテレフタレートやポリエチレンナフタレート、ノルボルネン系ポリマーやセルロース系ポリマー、それらポリマーの２種又は３種以上を混合したポリマーなどがあげられる。また負の正の固有複屈折性を示す高分子の例としては、スチレン系ポリマーやアクリル系ポリマー、それらの脆性を改良したスチレン系コポリマーやアクリル系コポリマー、それらポリマーの２種又は３種以上を混合したポリマーなどがあげられる。

【００１３】屈折率異方性フィルムは、例えばフィルムを一軸延伸や二軸延伸等の適宜な方式で処理してフィルムを形成する高分子を配向させることにより形成でき、光透過率に優れて配向ムラや位相差ムラの少ないものが好ましく用いうる。ちなみに一軸延伸による配向処理により延伸方向をｎｘ方向として、正の固有複屈折性を示す高分子ではｎｘ＞ｎｙ（完全一軸延伸ではｎｘ＞ｎｙ＝ｎｚ）、負の固有複屈折性を示す高分子ではｎｘ＜ｎｙ（完全一軸延伸ではｎｘ＜ｎｙ＝ｎｚ）の屈折率異方性を有するフィルムが得られる。

【００１４】位相差層（Ａ）、（Ｂ）を形成する屈折率異方性フィルムは、面内屈折率のｎｘとｎｙが相違するものであればよく、厚さ方向の屈折率ｎｚは上記した位相差特性を満足する範囲で任意な値を採りうる。従ってｎｚは、ｎｘとｎｙの一方又は両方よりも大きくてもよいし、小さくてもよく、またｎｘとｎｙの中間やｎｘとｎｙの一方と同じであってもよい。なお上記した位相差特性は、ｎｘ、ｎｙ、ｎｚを制御する方式やフィルム厚ｄを制御する方式などにて達成することができる。その場合、フィルム厚ｄは１～５００μm、就中１０～３５０μm、特に２０～２００μmとすることが一般的である。

【００１５】位相差層（Ｃ）は、正又は負の固有複屈折性を示す液晶化合物をその光軸が層平面の法線方向に対し傾斜するように配向させたものにて形成される。その形成は、例えば重合性の液晶や液晶ポリマーを電場や磁場等の印加下に、あるいはラビング膜や光利用の配向膜等を介して分子軸が層面に対し傾斜するように配向させた後、光や熱等を介して重合性液晶を重合処理する方式や加熱配向の液晶ポリマーを急冷固定化する方式などの適宜な方式にて行うことができる。位相差層（Ｃ）の傾斜配向等に基づく光学特性は、補償対象のＴＮ液晶の光学特性などに応じて適宜に決定することができる。位相差層（Ｃ）の厚さは、目的とする位相差特性等に応じて適宜に決定でき一般には液晶層厚に基づき１００μm以下、就中２０μm以下、特に０．１～１０μmとされるがこれに限定されない。

【００１６】位相差層（Ｃ）を形成する正又は負の固有複屈折性を示す液晶化合物としては、ディスコチック系やネマチック系、コレステリック系やスメクチック系のものなどの適宜なものを１種又は２種以上を用いることができる。就中、傾斜配向の処理性などの点より負の固有複屈折性（△ｎ＜０）を示す液晶化合物としては上記したワイドビューフィルムにおける如きディスコチック系のものが好ましく用いられ、正の固有複屈折性（△ｎ＞０）を示す液晶化合物としては上記したＮＨフィルムにおける如きネマチック系のものが好ましく用いうる。なお前記の△ｎは（ｎｅ－ｎｏ）を意味する。

【００１７】前記の位相差層（Ｃ）によりその傾斜配向特性に基づいて、それを層の法線方向から光軸の傾斜方向（＋方向）又はその反対方向（－方向）に傾けた場合に、法線方向を基準（入射角０度）として前記のプラスとマイナスの方向で位相差が対称形となることを回避でき補償効果の向上を図ることができる。

【００１８】すなわち正の固有複屈折性を示すＴＮ液晶は、液晶セル中で電圧印加による黒表示時に光軸がセル基板に対し傾斜した状態となることより、負の固有複屈折性を示す液晶化合物が傾斜配向した位相差層（Ｃ）にて電圧印加の黒表示時の補償を有利に行うことができて視野角を改善できる。また正の固有複屈折性を示す液晶化合物が傾斜配向した位相差層（Ｃ）にて中間調表示状態の補償を有利に行うことができる。

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【００１９】複合位相差板は、図１の例の如く位相差層の（Ａ）と（Ｂ）と（Ｃ）のそれぞれを用いた積層体として形成することができる。積層体の形成に際し前記Ａ、Ｂ、Ｃの各位相差層は、それぞれ１層又は２層以上を用いることができ、それらの配置順序について特に限定はない。また積層体の形成に際し位相差層（Ａ）、（Ｂ）、（Ｃ）は適宜な配置関係としうるが、一般にはそれぞれの遅相軸が可及的に平行又は直交するように配置することが補償効果等の点より好ましい。複合位相差板における位相差等の制御は、位相差層（Ａ）、（Ｂ）、（Ｃ）の組合せや使用数、遅相軸等の配置角度の調節などにて行うことができる。

【００２０】更に前記積層体の形成に際し位相差層（Ａ）、（Ｂ）は、フィルムからなることにより必要に応じて位相差層（Ｃ）の支持基材や偏光フィルムの透明保護層を兼ねさせて薄型化等を図った形態とすることもできる。特に図１の例の如く複合位相差板１を形成する位相差層（Ａ）、（Ｂ）１１、１３、１４、１６の一方に位相差層（Ｃ）１２、１５の支持基材を兼ねさせると共に、位相差層（Ａ）、（Ｂ）の他方に偏光フィルムの透明保護層を兼ねさせた状態で複合位相差板１と偏光板２を積層した光学補償偏光板とすることにより、その薄型化や製造プロセスの短縮化を図ることができて好ましい。図例の如く位相差層の（Ａ）と（Ｂ）の間に液晶層からなる位相差層（Ｃ）を位置させた形態は取扱時等における位相差層（Ｃ）の保護等の点より好ましい。なお位相差層の積層に際しては粘着剤等の適宜な接着剤を用いることができる。

【００２１】上記の如く位相差層の（Ａ）、（Ｂ）、（Ｃ）の組合せによる複合化にて新たな位相差特性を付与できて、ＴＮ液晶の複屈折による位相差やその視角による変化等を補償しうる各種の位相差特性を示す豊富な位相差板を得ることができ、ＴＮ液晶の配向状態等の違いによる複屈折特性の相違に対しても高精度に補償することができる。

【００２２】すなわち従来の上記したワイドビューフィルムやＮＨフィルムの如く位相差層の（Ａ）と（Ｃ）のみでは、例えば６０度以上の視野角でのコントラストが大きく低下する点や白表示で着色が発生する点、あるいは黒表示で変色して黒色でなくなる点などの補償効果に不足する点を位相差層（Ｂ）で補って少なくとも当該３層の位相差層にて補償することにより、法線（正面方向）に対し略８０度の全方位角による広い視野角で表示色の変化なしに良好なコントラストを示すＴＮ型液晶表示装置を形成することも可能である。

【００２３】本発明による複合位相差板は、そのまま実用に供することもできるし、図１の例の如く偏光板２と積層して光学補償偏光板として実用に供することもできる。その光学補償偏光板の形成には、適宜な偏光板を用いることができ、その種類について特に限定はない。就

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中、所定振動面の直線偏光を透過し、他の光は吸収する特性を示す吸収型の偏光板が高い偏光度の点などより好ましく用いうる。

【００２４】ちなみに前記偏光板の例としては、ポリビニルアルコール系や部分ホルマール化ポリビニルアルコール系、エチレン・酢酸ビニル共重合体系部分ケン化物の如き親水性高分子のフィルムにヨウ素及び／又は二色性染料等の二色性物質を吸着させて延伸配向処理した偏光フィルムやポリエン配向の偏光フィルムなどが用いられる。

【００２５】また偏光板は、偏光フィルムの片面又は両面に透明保護層を設けたものなどであってもよい。透明保護層は、偏光フィルムの補強、耐熱性や耐湿性の向上などの種々の目的で設けられる。透明保護層は、樹脂の塗布層や樹脂フィルムのラミネート層などとして形成でき、拡散化や粗面化用等の微粒子を含有していてもよい。また透明保護層は、上記した如く位相差層（Ａ）、（Ｂ）として設けられていてもよい。その場合には、図例の如く本発明による複合位相差板を形成する位相差層（Ａ）又は（Ｂ）が偏光板２における偏光フィルムの片側の透明保護層を兼ねることとなり、光学補償偏光板の薄型化や液晶表示装置の組立効率の向上に有利である。

【００２６】用いる偏光板はさらに、特に複合位相差板を設けない側に表面反射の防止などを目的に反射防止層や防眩処理層が設けられたものであってもよい。反射防止層は、例えばフッ素系ポリマーのコート層や多層金属蒸着膜等の光干渉性の膜などとして適宜に形成することができる。一方、防眩処理層も、例えば微粒子含有の樹脂塗工層やエンボス加工、サンドブラスト加工やエッチング加工等の適宜な方式で表面に微細凹凸構造を付与するなどにより表面反射光が拡散する適宜な方式で形成したものであってよい。

【００２７】なお前記の微粒子には、例えば平均粒径が０．５～２０μmのシリカや酸化カルシウム、アルミナやチタニア、ジルコニアや酸化錫、酸化インジウムや酸化カドミウム、酸化アンチモン等の導電性のこともある無機系微粒子や、ポリメチルメタクリレートやポリウレタの如き適宜なポリマーからなる架橋又は未架橋の有機系微粒子などの適宜なものを１種又は２種以上用いうる。

【００２８】光学補償偏光板における複合位相差板の進相軸等と偏光板の透過軸等との配置関係については特に限定はなく、適宜に決定することができる。一般には偏光板の透過軸と複合位相差板の面内最大屈折率方向を平行関係又は直交関係に配置することが、正面（垂直）方向の特性には影響を与えずに視角が変化する斜め方向の特性を制御して視野角の拡大等を図る点より好ましい。

【００２９】本発明による複合位相差板や光学補償偏光板を形成する位相差層や偏光板等の各層は、分離状態にあってもよいが、層間の屈折率差調節による反射の抑制

や光学系のズレ防止、ゴミ等の異物の侵入防止などの点よりその一部、就中、全部が固着処理されていることが好ましい。その固着処理には例えば透明な接着剤などの適宜なものを用いることができ、接着剤等の種類について特に限定はない。構成部材の光学特性の変化防止などの点より、接着処理時の硬化や乾燥の際に高温のプロセスを要しないものが好ましく、長時間の硬化処理や乾燥時間を要しないものが望ましい。かかる点よりは粘着層が好ましく用いうる。

【００３０】粘着層の形成には、例えばアクリル系重合体やシリコーン系ポリマー、ポリエステルやポリウレタン、ポリエーテルや合成ゴムなどの適宜なポリマーを用いてなる透明粘着剤を用いることができる。就中、光学的透明性や粘着特性、耐候性などの点よりアクリル系粘着剤が好ましい。なお粘着層は、液晶セル等の被着体への接着を目的に複合位相差板や光学補償偏光板等の片面又は両面に必要に応じて設けることもできる。粘着層が表面に露出する場合には、それを実用に供するまでの間、セパレータなどを仮着して粘着層表面の汚染等を防止することが好ましい。

【００３１】本発明による複合位相差板や光学補償偏光板は、液晶、特にＴＮ液晶による複屈折に対する補償板などとして液晶表示装置の形成に好ましく用いうる。液晶表示装置は一般に、偏光板や液晶セルや補償板、必要に応じてのバックライトないしフロントライトや反射板等の構成部品を適宜に組立てて駆動回路を組込むことなどにより形成されるが、本発明においては上記した複合位相差板や光学補償偏光板を用いる点を除いて特に限定はなく、従来に準じて液晶表示装置を形成することができる。

【００３２】従って液晶表示装置の形成に際しては、例えば視認側の偏光板の上に設ける光拡散板やアンチグレア層やプリズムシート、反射防止膜や保護層や保護板、バックライトに設けるプリズムシート等の光路制御板などの適宜な光学素子を適宜に配置することができる。なお補償板は通例、図例の如く液晶セル３と視認側又は／及びバックライト側の偏光板２との間に配置される。従って本発明による複合位相差板又は光学補償偏光板は、液晶セルの少なくとも片側に配置されていればよい。

【００３３】

【実施例】実施例１

厚さ１００μmのノルボルネン系ポリマーフィルム（ＪＳＲ社製、アートン）をテンター延伸機にて１７５℃で延伸処理して、ｎｘ＞ｎｙ＞ｎｚの屈折率特性を有して、＊波長５９０nmの単色光による（以下同じ）△ｎｘｙ・ｄが１０nmで、△ｎｘｚ・ｄ＝８０nm、△ｎｙｚ・ｄ＝７０nmの位相差層Ａ１を得た。なお屈折率等は、自動複屈折計（王子計測機器社製、ＫＯＢＲＡ－２１ＡＤＨ、以下同じ）にて測定した。

【００３４】次に前記の位相差層Ａ１の上に、加熱加湿処理下に接着剤を介し移着させる方式でワイドビューフィルム（ＷＶ０２Ａ）のディスコチック液晶ポリマーの傾斜配向層のみをその傾斜方向が位相差層Ａ１の面内最大屈折率（ｎｘ）の方向（延伸方向）と平行になるように転写して位相差層Ｃ１を積層して積層体を得た。この積層体の面内最大屈折率をＮｘ、その方向に直交する方向の屈折率をＮｙ、Ｎｘ－Ｎｙを△Ｎｘｙ、厚さをＤとしたとき、積層体の△Ｎｘｙ・Ｄは１３０nmであった。なおＮｘは、前記ｎｘに対し直交する方向であった。

【００３５】ついで前記の位相差層Ｃ１の上に、厚さ１２５μmのアクリル系系ポリマーフィルム（三菱レーヨン社製、アクリプレン）をテンターにて１１０℃で一軸延伸処理（ｎｘ方向）して得たｎｙ＝ｎｚ＞ｎｘの屈折率特性を有して△ｎｘｙ・ｄ＝△ｎｘｚ・ｄ＝３０nm、△ｎｙｚ・ｄ＝０nmの位相差層Ｂ１をアクリル系粘着層を介し積層し、複合位相差板を得た。

【００３６】次に厚さ７５μmのポリビニルアルコールフィルムをヨウ素を含む水溶液中で染色した後、ホウ酸を含む水溶液中で周速の異なるロール間にて６倍に一軸延伸して得た偏光フィルムの片面にポリビニルアルコール系接着剤を介し厚さ８０μmのトリアセチルセルロースフィルムを接着し、偏光フィルムの他面にポリビニルアルコール系接着剤を介し前記の複合位相差板をその位相差層Ａ１を介し接着積層して光学補償偏光板を得た。

【００３７】比較例

複合位相差板に代えて、上記した位相差層Ａ１と位相差層Ｃ１との積層体を用いてその位相差層Ａ１を介し接着積層したほかは実施例１に準じて光学補償偏光板を得た。

【００３８】評価試験

実施例１及び比較例で得た光学補償偏光板をＴＮ型液晶セルの両面に偏光板が外側となるように接着して液晶表示装置を得、コントラスト測定器（ＥＬＤＩＭ社製、ＥＺContrast）にてその表示コントラストの視野角特性を調べた。その結果を、等コントラスト曲線にて図２に示した。また上下左右方向のコントラスト１０基準の視野角特性を次表に示した。

	上方向	下方向	左方向	右方向
実施例１	６０度	８０度以上	８０度以上	８０度以上
比較例	５２度	５２度	６０度	６３度

【００３９】以上の結果より、実施例においてはほぼ全方位において良視認の視野角が大きく拡大されていることがわかる。

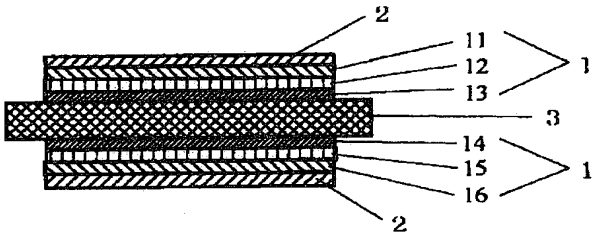
【図面の簡単な説明】

【図１】液晶表示装置例の断面図

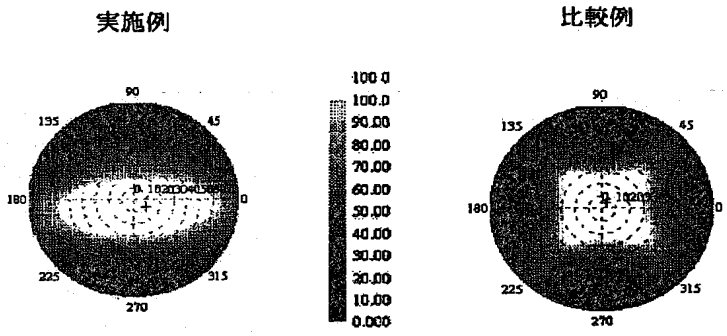
【図２】実施例１及び比較例の等コントラスト曲線

【符号の説明】
1：複合位相差板
１１，１６：位相差層（Ａ）
１３，１４：位相差層（Ｂ）
＊１２，１５：位相差層（Ｃ）
2：偏光板
3：液晶セル
＊

【図１】



【図２】



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